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STATE OF ALASKA

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ANNUAL REPORT OF PROGRESS, 1961-1962

FEDERAL AID IN FISH RESTORATION PROJECT F-5-R-3

SPORT FISH INVESTIGATIONS OF ALASKA

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INTRODUCTION

This report of progress consists of the job completion reports from the State of Alaska Federal Aid in Fish Restoration Project F-5-R-3, "Sport Fish Investigations of Alaska."

The current project is composed of twenty separate studies and was designed to evaluate the various aspects of the State's recreational fishery resources. The information gathered will provide the necessary background data for better management practices and for the development of future studies. During the current segment, continued emphasis was placed on the overall inventory and cataloging of accessible waters, evaluation of catch data, and investigations on various species of fish.

As a result of several problems of immediate concern, several new studies were instigated during the report year. Data accumulated from these studies has helped solve some problems in projects already in progress.

The population of Alaska is increasing rapidly and this is being reflected in the ever increasing number of "No Trespassing" signs put up by individuals in the vicinity of population centers. Fortunately, much of Alaska's fishery waters are still in the public domain. The division's program of acquiring access to fishing waters continued at a much faster pace since being instigated in 1959. Emphasis is being placed on this job and the successful continuation of this activity will forstall many serious recreational use problems currently facing other states.

The enclosed progress reports are fragmentary in many respects and the interpretations contained therein are subject to re-evaluation as the work progresses.

Volume 3 Report No. 8-C-2

JOB COMPLETION REPORT

RESEARCH PROJECT SEGMENT

State: ALASKA

Project No: F-5-R-3 Name: Sport Fish Investigations of Alaska

Job No: 8-C-2 Title: Mirror Lake Aeration Study

Period Covered: July 1, 1961 to May 30, 1962.

Abstract:

The aeration device was installed in January and operated continuously until April 25. One thousand feet of perforated, weighted, plastic hose was used. Tests for dissolved oxygen were taken periodically from five different sampling stations. No noticeable effect from the aeration device was noted in the dissolved oxygen of the five stations. The aeration device melted twenty inches of ice in two days. The water remained open for a width of about forty feet even in sub-zero temperatures. No mortality of fish was noted after the ice cover left the lake.

Recommendations:

It is recommended that this study be continued. It is further recommended that attempts be made to obtain dissolved oxygen samples from the open water.

Objectives:

To measure the effectiveness of mechanical aeration in Mirror Lake during ice cover periods.

Techniques Used:

After considerable delay, a right-of-way easement was obtained so that the electric power company could construct a power line to the edge of the lake. The right-of-way was handled by the Department lands man and was obtained from the Bureau of Land Management. The air compressor for supplying air to the submerged hose was housed in a small, weather-proof unit to keep out the elements and prevent vandalism. The unit was about 40 feet from the shore of the lake. From the compressor to the lake a one-fourth inch steel air pipe was used and placed so that the end of the pipe was beneath the ice. To this was attached 250 feet of weighted, non-perforated plastic hose. At the end of the plastic hose, a "y" was connected so that 1,000 feet of weighted, perforated plastic hose formed a square with the ends attached to the "y". This allowed the air to enter the perforated hose at two places. The installation of the hose under the ice was easily accomplished with the aid of an "ice-jigger". A problem arose from water condensation in the one-fourth inch pipe. After removal of the ice from the pipe, it would take about four days to become blocked again. This pipe was replaced with one-half inch pipe which solved the problem. Tests for dissolved oxygen and temperature were taken periodically, along with snow cover and ice thickness measurements.

Findings:

Mirror Lake, also known as Bear Lake, is twenty-two miles north of Anchorage and is located next to the Palmer highway (Figure 1). The lake has a surface area of 65 acres and a maximum depth of ten feet. The outlet flows through a culvert under the highway and after about fifty yards seeps underground. There are no streams flowing into the lake; the water level is maintained by seepage. Mirror Lake was rehabilitated with rotenone in 1955. In subsequent years it has been planted with both rainbow trout and silver salmon. The lake is extremely popular for various water sports, including fishing. Due to its proximity to a populous area, this lake is fished heavily the entire year. The lake is shallow and partial winter-kills have been observed in the past. In order to prevent or minimize the winter-kill,

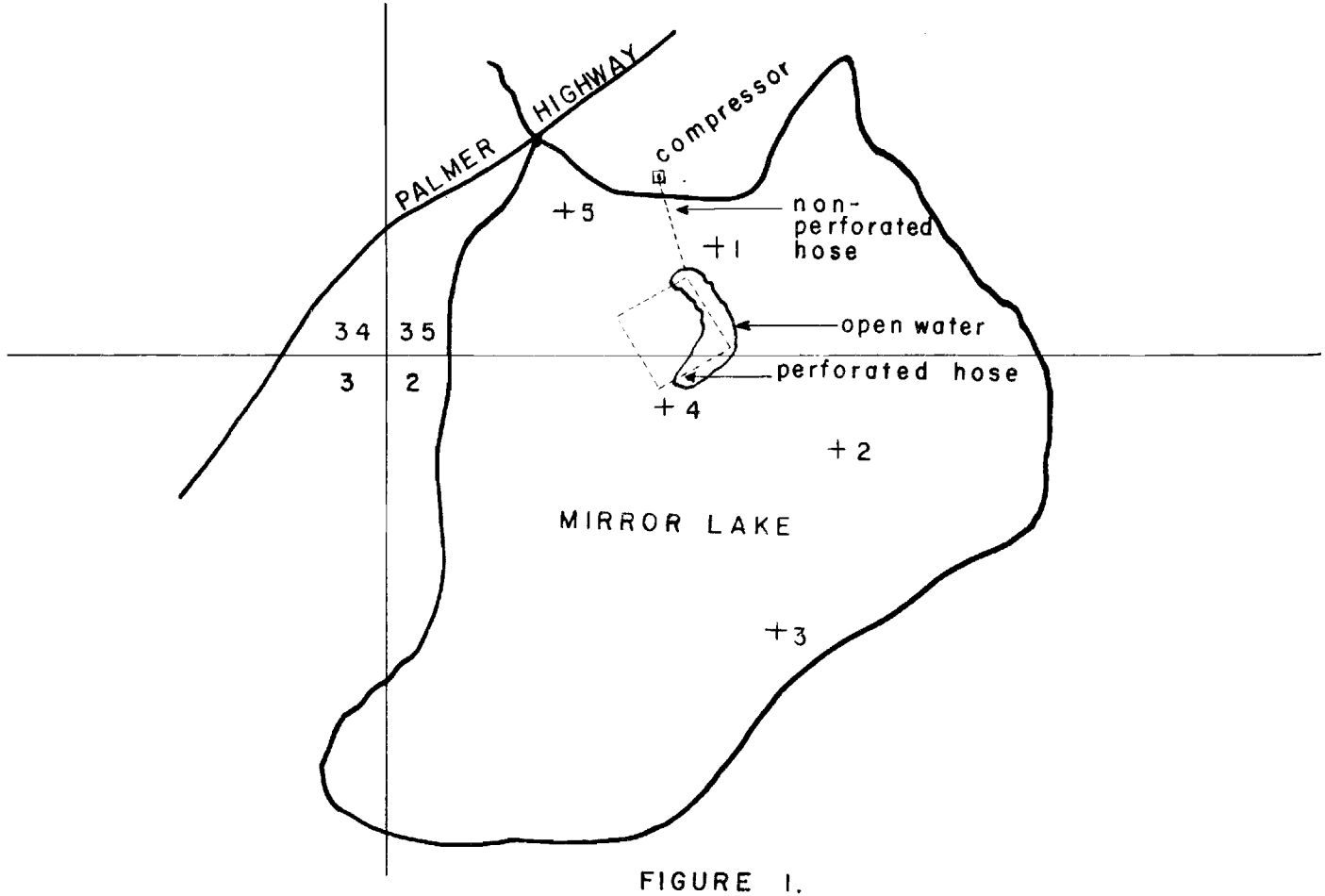

FIGURE 1.

MIRROR LAKE SHOWING LOCATION OF THE AERATION SYSTEM AND STATIONS WHERE DISSOLVED OXYGEN TESTS WERE TAKEN.

some sort of aeration device was needed to maintain a suitable oxygen level. Two air compressor units, each with a 250-foot weighted lead hose and one thousand feet of weighted, perforated, plastic hose were purchased from the "Hinde Engineering Corporation".

It took some time to obtain access for an electric power line to the lake, however, all electrical connections were installed in January, and the unit was immediately put into operation. The compressor was located about 40 feet from the edge of the lake. A 1/4 inch steel pipe was placed between the compressor and the plastic hose underneath the ice at the edge of the lake. This size pipe did not work satisfactorily because condensed water froze and blocked it. The steel pipe was thawed several times and de-icing liquids used but the trouble still prevailed. After three weeks, the 1/4-inch pipe was replaced with 1/2-inch pipe. This solved the condensation problem.

Initially twenty inches of ice was melted after two days of operation. The ice did not melt completely over the full length of the hose and it was found, after completion of the project, that the hose had kinked at the center of the south leg of the square. However, ice had melted completely on one leg, about 200 feet on another leg, and about 50 feet on the third leg of the rectangular pattern that was originally set.

The width of open water was about 40 feet, which remained more or less constant until March when it reached 50 feet and gradually widened until breakup on April 25, at which time the system was removed and prepared for storage.

Five stations were established where temperatures and dissolved oxygen were taken (Figure 1).

Station I was located about 150 feet north of the open water where there was less than five feet of water between the underside of the ice to the lake bottom (See Figure 1). Samples were necessarily taken just below the ice and the depths recorded were measured from the bottom of the ice (Table I). No apparent influence was noted at this station

TABLE I.

Dissolved Oxygen, pH, Temperature, Snow and Ice Depths at Station I on Mirror Lake From February Through April 1962.

Date	Depth of Sample	Snow Cover	Ice Cover	Water Temperature	Dissolved Oxygen	pH
Feb. 7	0	6"	24"	33°F	4.9	7.7
Feb. 14	0	6	26	32	5.0	7.3
Feb. 21	0	6	26	33	3.3	
March 1	0	8	24	32	2.9	
March 8	0	9	24	33	3.8	
March 15	0	2	24	32	3.7	
March 22	0	8	25	32	4.6	
March 29	0	7	25	34	3.9	
April 5	0	2	25	34		
April 12	0	-	24	35	4.7	
April 18	0	-	24	34	6.5	

from operation of the aeration system. Station II was located about 600 feet from the open water. The dissolved oxygen was low during all sampling periods (Table II). Station III was located about 800 feet from the open water and near the shore of the lake across from the aeration system. The water was less than five feet deep. No influence from the aeration device was noted (Table III). Station IV was located as near the open water as could be safely sampled, within about thirty feet (Table IV). In comparing the dissolved oxygen from other stations, the aeration device did not increase the oxygen content of the water within thirty feet of the open water. Station V was located near the outlet about 500 feet from the open water. Again, at this station the dissolved oxygen readings were low (Table V). The dissolved oxygen was low at all stations covered during the report period. Station II had the lowest recorded dissolved oxygen on March 1 which was 1.9 ppm. The April 5th record was deleted due to the absence of proper chemicals, which resulted in an abnormally high reading. It is interesting to note that the pH changed from slightly alkaline just past neutral, to a very slight acidic condition. Whether this device prevented a winter-kill of fish is not known; however, after the ice went out, no dead fish could be found along the shores of the lake or in the shallow areas. While searching for dead fish, many silver salmon schools were observed surfacing in various areas of the lake.

TABLE II.

Dissolved Oxygen, pH, Temperature, Snow and Ice Depths at Station II on Mirror Lake From February Through April 1962.

Date	Depth of Sample	Snow Cover	Ice Cover	Water Temperature	Dissolved Oxygen	pH
Feb. 7	0	6"	26"	32°F	4.4	
	5			35	3.1	
Feb. 14	0	6	26	32	3.4	7.6
	5			33	3.4	7.6
Feb. 21	0	6	26	32	3.5	7.6
	5			35	2.8	7.4
March 1	0	7	25	33	3.2	7.2
	5			34	1.9	7.2
March 8	0		26	32	2.6	7.2
	5			34	2.2	7.2
March 15	0	10	26	32	2.4	7.3
	5			33	2.2	7.2
March 22	0	7	27	32	4.0	7.2
	5			33	3.2	
March 29	0	6	27	36	3.0	7.2
	5			36	3.2	7.2
April 5	0	2	27	34		7.3
	5			36		7.3
April 12	0	0	26	35	4.4	7.3
	5			36	3.5	7.3
April 18	0	0	25	34	5.7	6.8
	5			36	4.5	6.9

TABLE III.

Dissolved Oxygen, pH, Temperature, Snow and Ice Depths at Station III on Mirror Lake From February Through April 1962

Date	Depth of Sample	Snow Cover	Ice Cover	Water Temperature	Dissolved Oxygen	pH
Feb. 7	0	6"	16"	33°F	3.3	
Feb. 14	0	6	23	32	3.4	7.8
Feb. 21	0	6	23	33	3.5	
March 1	0	9	24	32	2.3	7.1
March 8	0	8	25	32	2.3	7.2
March 15	0	9	26	32	2.5	
March 22	0	9	26	32	4.7	
March 29	0	6	27	34	2.8	

TABLE III. (Cont.)

Dissolved Oxygen, pH, Temperature, Snow and Ice Depths at Station III on Mirror Lake From February Through April 1962

Date	Depth of Sample	Snow Cover	Ice Cover	Water Temperature	Dissolved Oxygen	pH
April 5	0	2	27	34		
April 12	0	0	26	34	5.0	
April 18	0	0	24	33	3.0	

TABLE IV.

Dissolved Oxygen, pH, Temperature, Snow and Ice Depths at Station IV on Mirror Lake From February Through April 1962.

Date	Depth of Sample	Snow Cover	Ice Cover	Water Temperature	Dissolved Oxygen	pH
Feb. 7	0	5"	24"	32°F	3.6	7.9
	5			35	3.3	
Feb. 14	0	5	23	32	3.3	7.8
	5			35	2.6	7.8
Feb. 21	0	5	23	33	3.1	7.5
	5			35	2.4	7.6
March 1	0	8	24	32	2.5	7.2
	5			33	2.1	7.1
March 8	0	8	24	32	2.5	7.2
	5			35	2.0	
March 15	0	9	25	32	2.3	7.3
	5			34	2.3	7.3
March 22	0	8	26	32	3.5	7.3
	5			33	3.1	7.3
March 29	0	6	26	34	2.8	7.2
	5			34	2.8	7.2
April 5	0	2	25	34		7.3
	5			35		7.3
April 12	0	0	25	36	4.5	7.3
	5			37	3.8	7.3
April 18	0	0	24	33	8.0	6.9
	5			35	4.9	6.9

TABLE V.

Dissolved Oxygen, pH, Temperature, Snow and Ice Depths at Station V on Mirror Lake From February Through April 1962.

Date	Depth of Sample	Snow Cover	Ice Cover	Water Temperature	Dissolved Oxygen	pH
Feb. 7	0	5"	16"	32°F	3.6	7.7
Feb. 14	0	5	22	33	3.3	
Feb. 21	0	5	22	33	2.7	
March 1	0	8	24	33	2.7	
March 8	0	9	23	32	2.6	
March 15	0	7	25	32	2.2	
March 22	0	9	24	32	2.8	
March 29	0	5	24	34	3.0	
April 5	0	2	23	34		
April 12	0	0	23	35	4.0	
April 18	0	0	23	33	5.3	

The flow of water at the outlet was measured several times, using the Embody formula. The volume of water flowing out of the lake ranged from 171 to 239 gallons per minute, with an average of 195 gallons per minute, as measured from March 22 to April 18.

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